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A few of the exercises may be cited:

1. Near the muzzle of the three-inch gun the rifling makes one turn per 25 calibers. If the projectile leaves the muzzle with a velocity of 1,700 feet per second, how many rotations about its axis does it make per second? Ans. 272.

2. The total length of the French 155 mm. cannon is 2.332 m. Express this in calibers. Ans. 15.05.

3. In rising above the earth's surface the temperature falls about 6° C. for each kilometer of altitude up to eleven kilometers and thereafter remains practically stationary. What increase in elevation (to the nearest ten feet) will lower the temperature 1° F.? Ans. 300 ft.

4. For a range of 3,000 yards the 3-inch gun is elevated at an angle of $5° 5.3'$ above the line joining gun and target. When fired the projectile actually leaves the gun at an angle of 92.3 mils about this line. How much is the former angle increased by the "jump" of the gun as it is fired? Ans. 1.8 mils.

5. A scout measures the angle between a line to an object C and the straight road along which he is passing. He proceeds along the road until, 1,300 yards farther, a line to C makes with the road an angle twice as great. How far is he then from C? Ans. 1,300 yds.

Note. This is the method used by sailors in "doubling the angle on the bow."

6. A reconnaissance officer has an accurate map of the surrounding region but does not know his exact position on the map. He sees two objects A and B, which are shown on the map. He measures the angle between the two points and draws lines through A' and B', the map positions of the two points, to meet at the angle found at some point C' on the map. Show that the true position is on the circle drawn through A', B' and C'. If he recognizes a third point whose map position is known he can get a second circle on which his position lies. His true position is at the intersection of these circles.

Note. This is the method of "Italian Resection" used to locate a position with a plane table.

7. In maps based on English units 1 in. to the mile, 3 in. to the mile, 6 in. to the mile, and 12 in. to the mile, are commonly used scales. Find the representative fractions of these maps? Ans. (*a*) 1/63360, (*b*) 1/21120, (*c*) 1/10560, (*d*) 1/5280.

8. Find the area of a shrapnel pattern 100 yds. long and 35 yds. wide. Ans. 2,749 sq. yds.

9. Find the danger space for a horse 15 hands high when the trajectory makes an angle of 252 mils with the ground. Ans. 20 ft.

10. An observer 2,000 yds. from the battery and 3,540 yards from the target finds the angle between the battery and the target to be 114 degrees. Find the range from the battery to the target. Ans. 4,721 yds.

11. Find the range and deflection components of a wind of ten miles per hour blowing from the southwest if the target is due east of the battery.
Ans. range component = deflection component = 7.1 mi. per hr.

12. How far is the B. C. station from the right gun if the wheel of the gun carriage, which is 56 in. in diameter, subtends an angle of 4 mils? Ans. 390 yds.

13. Of ten shots fired at a range of 2,500 yds. eight are to the right of the target and two to the left of it. What change should be made in the deflection? Ans. Increase 7 mils.

Only five or six misprints were noted.

ALBERT A. BENNETT.

UNIVERSITY OF TEXAS,
May, 1919.

A First Course in Calculus. By W. P. MILNE and G. J. B. WESTCOTT. Part 1: Powers of x. London, G. Bell & Sons Ltd., 1918. 12mo. 20 + 196 pp. Price 3s. 6d.

This little book (namely part 1) duodecimo, and only about half an inch thick, covers roughly a half of what is usually found in American texts on the calculus. The treatment is very well graded, the important ideas are approached gradually and developed at length. Long or troublesome proofs are avoided throughout.

This is made possible by deferring or omitting such topics as the differentiation and integration of transcendental analytic functions, the general evaluation of indeterminate forms, the evolute and involute, general criteria for maxima and minima, mean value theorems, partial differentiation, envelopes, series, singular points and asymptotes, hard definite multiple integrals, and the like; secondly, by explicitly assuming formulas without proof in certain cases, as in physical formulas, and geometric formulas, for example that for radius of curvature, etc.; thirdly, by outlining rather than completing the method of proof in a few instances in which the details of rigor would not appeal to the pupil. The authors state in the preface "there is no attempt whatever to discuss the philosophy of 'limits' and such like" and "It is hoped, therefore, that the treatment will be found suitable for boys and girls in the upper classes of the Secondary Schools, for the pupils in Army Classes, and for students in the Technical schools and colleges."

The book is exceedingly rich in interesting and suggestive exercises, a feature characteristic of most British texts. These exercises are perhaps even too numerous to be useful. They show a strong inclination to be "practical" as is evidenced by the fact that coefficients are seldom selected as integers, and results do not "come out exact" but are usually desired correct to two decimal figures, and that instead of remaining within the subject of algebra, they roam over all branches of elementary physical science. A student completing the course will have not only a facility in handling elementary derivatives, definite integrals and a few types of differential equations, but should have a fair grasp of the significance of many of the laws of mechanics. The print and the make-up of the book are attractive and misprints appear to be rare. The figures are poorly drawn; the perspective ellipses, pages 134, 135, are obviously drawn as circular lunes with sharp corners. The parabola (Fig. 68) has a point of inflection.

A complete set of answers and a usable index are found in the back of the book, and an historical introduction of an entertaining nature opens the text. The wholesale acceptance by the authors of J. M. Child's view that Barrow was the discoverer of the calculus is interesting, but the authors do not pretend to attempt to lend scholarly weight to this view, nor to enter into polemics. They accept what has appeared in print without being sufficiently interested to give the exact reference for their quotation. The book is one of a series of which the best known to American readers is undoubtedly Sommerville's *Elements of Non-Euclidean Geometry*.

It is unfortunate that in their quest for methodological excellence, the authors have paid so little regard to questions of exactness in phraseology. One can hardly read a half dozen consecutive pages without noting some instance of looseness in the language or notation employed. This lack of precision while always irritating is in most of the individual instances trifling, and merits mention only on account of its frequency. Unlike the situation familiar to us in numerous elementary American text-books, the current ambiguity is usually avoided in the more important definitions and explanations. But one or two instances need be cited of features almost characteristic of the book. After giving a satisfactory definition of maximum, and after having previously treated irregular physical curves, the statement is made (page 30), "then at points on the graph at which either y is a maximum or a minimum, the tangent is parallel to the axis of x." The possibility of a maximum being either a corner point or an end value, while illustrated in figures used in other connections (*e. g.*, Fig. 27, Fig. 46 and Fig. 57) is not even acknowledged throughout the whole book. Again, the sixth chapter bears the title "Differential Equations and Indefinite Integrals," but except for their place in the title the terms "integral," and "indefinite integral" do not appear in the text of the chapter, although assumed as familiar, page 68, example 9.

The term "derivative" appears nowhere in the book, the phrase "differential coefficient" being defined instead, although this in turn is casually referred to as "the differential" in example 40, page 35. The notion of a differential as distinguished from a derivative, according to the usage familiar to American readers, is never suggested.

It has been a tradition that even an approach to the meaning of a differential equation is in the nature of things inaccessible to a student who has not been drilled in so elementary a subject as trigonometry. This tradition is completely ignored in the present little treatise. Here a student with but the rudiments of algebra may easily acquire a grasp of what is meant by a differential equation, a definite integral and other fundamental terms, although applying these only to the "powers of x." It is true that the free use of technical nomenclature in some of the exercises might more than appal the American college freshman whose mathematical foundations have carefully shielded him from the harsh realities of "applications." Just how successfully from the pedagogical viewpoint the subject of the calculus may be split in a not unfamiliar fashion according to the functions used rather than the fundamental concepts employed, can only be examined in the light of the whole subject, and so far as this work is concerned judgment must be withheld since part two is not yet published. The efficiency of the part here at hand however raises squarely the issue as to whether the claims of the calculus as a freshman subject can be ignored even in institutions whose students are generally poorly prepared.

To the attention of all college teachers interested in the closer relationship between elementary mathematical technique and physical applications, as taught with simplicity and directness, this little book is recommended.

ALBERT A. BENNETT.

Des phénomènes gyroscopiques et de leurs principales applications à la navigation. By A. LUCAS. Paris, Challamel, 1918. Royal 8vo. 110 pp. Price in boards 7.80 francs.

Contents—Chapter I, Préliminaires, 1–20: Projections de la vitesse et de l' accélération d'un mobile sur trois axes rectangulaires; Equations du mouvement d'un point matériel et d'un corps solide libre; Mouvement d'un corps solide par rapport à des axes animés d'un mouvement de translation avec lesquels il est entraîné; Rotations; Composition des rotations; Problème sur le mouvement d'un corps ayant un point fixe; Moments d'inertie; Mouvement d'un corps